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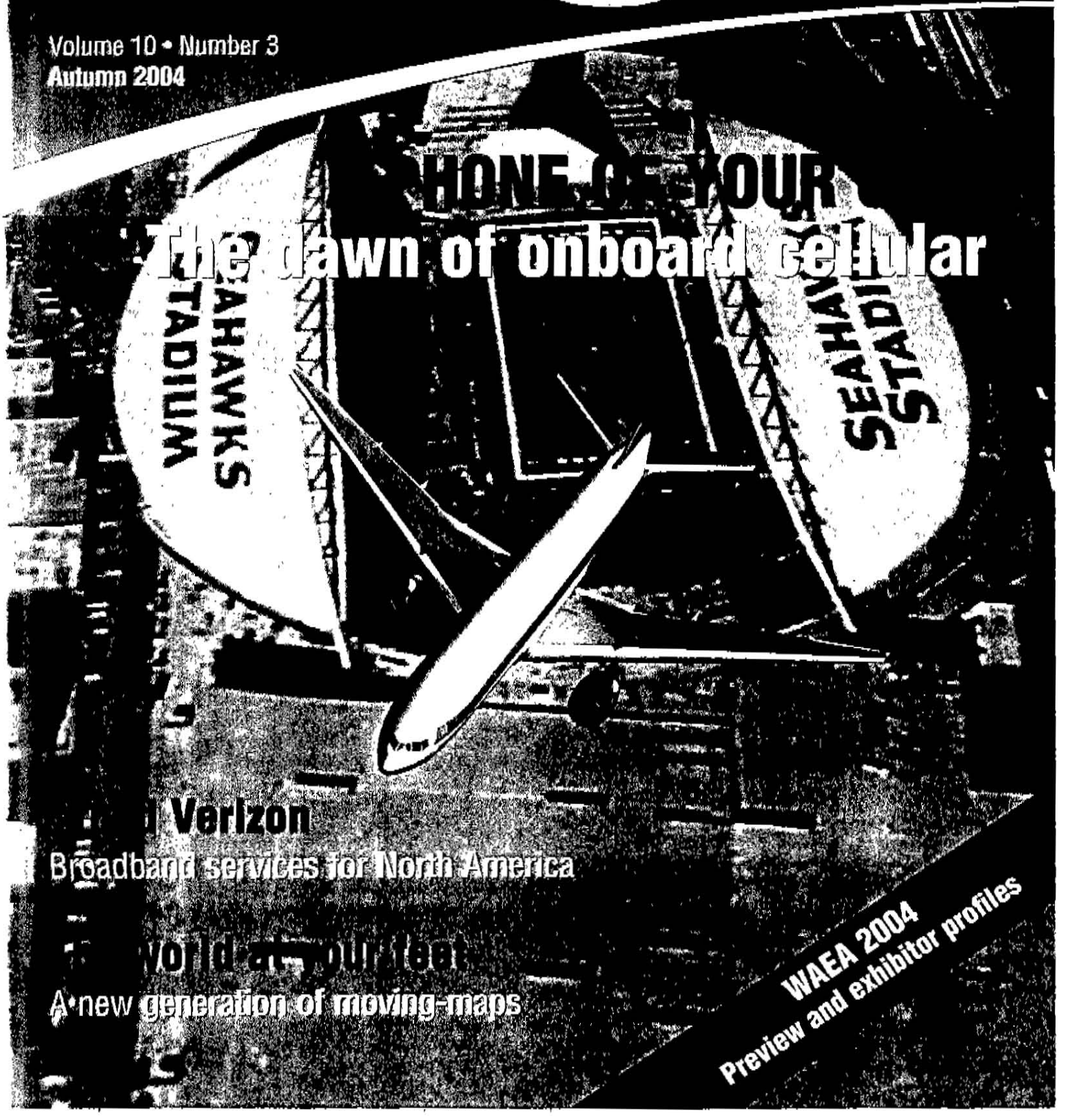


HONE...OUR
The dawn of onboard cellular

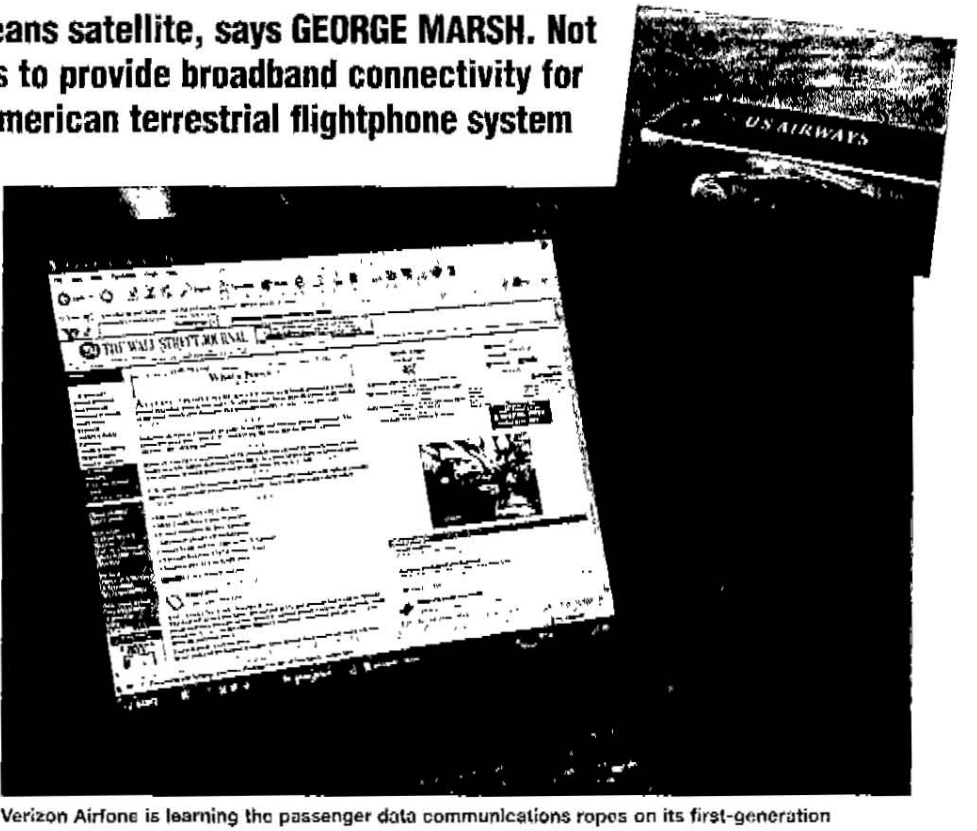
...Verizon
Broadband services for North America

...World at your feet
A new generation of moving-maps

WAEA 2004
Preview and exhibitor profiles

Broad Verizon

For many people broadband means satellite, says GEORGE MARSH. Not so Verizon Airfone, which plans to provide broadband connectivity for passengers through its North American terrestrial flightphone system



Verizon Airfone is learning the passenger data communications ropes on its first-generation JetConnect service, offered by US Airways, Continental and United

SATELLITE currently dominates the rush to supply broadband data services for passengers. But when your market lies within a single landmass it's not the only way, according to US inflight communications provider Verizon Airfone.

Airfone points out that most US air travel is domestic and regional and says it would be more economically served by a terrestrial infrastructure. The company is therefore about to upgrade its NATS-based flightphone service to deliver broadband data services.

The US company believes it is perfectly placed to provide affordable service in North America. Its coverage is focused on the USA, Mexico and, thanks to a partnership with a Canadian service provider, a 500-mile-deep belt of southern Canada. While the satellite connectivity providers offer international or global coverage based on expensive systems, some of which are still being paid for, Airfone will use its existing wholly owned infrastructure. Overheads are further reduced by the sharing of its ground network with the MagnaStar inflight phone system, popular with general-aviation operators.

One potential stumbling block is the need to get Federal Communications Commission permission to re-purpose the spectrum used for Airfone's present narrowband service. But the company hopes the FCC will see broadband as an innovative and worthwhile addition, and indeed negotiations are said to be advanced and proceeding well.

Verizon Airfone president Bill Pallone

Airfone wants to establish an air-ground data pipe broad enough for real-time access to the Internet, corporate virtual private networks, personal email accounts (Yahoo, AOL, MSN), streaming video and voice over Internet Protocol (VoIP) services.

"We expect to provide a couple of 1.25 MHz service channels, each supporting simultaneous data and voice service," says company president Bill Pallone. "And we're aiming for a bandwidth of well over two, possibly up to three, megabits per second, shared among the aircraft in a given sector."

Pallone says these speeds will satisfy customers, who repeatedly say in surveys that their priorities are instant messaging, email and genuine Internet/ intranet access. Bandwidth within the cabin will be much greater, with the potential to support delivery of data-intensive content to seats from on-board servers.

At the heart of the new Airfone system is the air-ground digital datalink. Data from the aircraft will pass via a radio transceiver in the avionics bay to a custom-designed antenna mounted on the aircraft belly. From there it will be beamed to the nearest available ground station among the 138 located throughout North America. From the station data will pass via a trunk connection to the company's primary switching centre near Chicago for routing to the intended recipient.

Off-the-shelf IP equipment

"ON the ground we'll have to change out the radios at our tower sites," says Pallone. "We intend to use IP-capable equipment bought off the shelf but hardened for the professional application environment. There will be some associated base station work and we'll have to modify their antennas."

Retrofitting an aircraft should be straightforward, Pallone claims, and capable of being completed during an overnight stop. For an aircraft that is already Airfone-equipped the upgrade will involve changing the transceiver and antenna, and installing a wireless cabin LAN based on two wireless access points

interfaced with the new transceiver. Partner OEMs are currently developing transceivers and antennas with form factors (and fuselage penetration requirements in the case of the antenna) similar to those of the existing units so that they can be directly interchanged.

Antennas can be expected to feature horizontal polarisation. This, together with means of limiting radiated power, will guard against the possibility of interference with cellular base stations on the ground. A total equipment complement should weigh little more than 100 lb.

Users should find dealing with the system intuitive, whether through seatback handsets or portable electronic devices. "We're working on providing passengers with the ability to use their own wireless devices, whether laptop or PDA," says Pallone. "Having a wireless cabin environment will avoid the complexities of physical connection, such as different connector interfaces. It will also save on aircraft installation cost and weight by avoiding network wiring and additional equipment."

Today's Verizon JetConnect offers instant and text messaging, plus access to text and graphics regularly uploaded to the aircraft server. The broadband services now in development by Verizon Airfone will support wireless access to email, the Internet and VoIP telephony

Overwater coverage via satellite

AIRFONE plans to meet the need of some domestic aircraft operators for inshore ocean coverage by passing traffic via an existing low Earth orbit (LEO) satellite system. Iridium and Globalstar are being assessed for the purpose.

Passengers will access the data service via their own laptops and an onboard IEEE 802.11b WiFi wireless LAN offering functionality comparable with that of a wired Ethernet. The voice service will be provided initially via existing seatback handsets or portable VoIP devices. Calls from the ground to passenger cellphone numbers will be routed to the seatback phone handset. Menu and screen facilities on each handset will keep users informed of call status while they wait for their calls to connect.

Airfone is also working towards technology that will enable passengers ultimately to use their own cellphones.

For users of the data service wireless access will be a clear advance over Airfone's present JetConnect narrowband messaging and information service, obtained by plugging a laptop or PDA into the seatback handset. JetConnect, launched nearly two years ago, offers passengers instant and text messaging plus access to text and graphic content that is uploaded

MAKING CABIN WIRELESS WORK

ONE broadband technology issue not yet settled is the protocol to be used for multiplexing several signals onto a single transmission path in a cabin wireless LAN. The spread-spectrum, frequency-hopping technologies used with present IEEE 802.11b-standard LANs are considered prone to signal degradation caused by multipath reflections, noise and other interference.

The committees responsible for choosing a new solution have rejected code-division multiple access (CDMA) and are looking at two alternatives.

One is orthogonal frequency-division multiplexing (OFDM), a derivative of frequency-division multiplexing originally developed by Bell Laboratories for naval use and today a key enabler of digital TV and DAB systems as well as wireless LANs.

OFDM splits the signal into several narrowband tones which are encoded to maintain separation between closely adjacent channels. This technique avoids interchannel crosstalk, permitting reliable extraction of data from the signal. A version of this spectrum-efficient system underpins the 802.11b WiFi services now entering widespread use in airport lounges, convention centres and other business foci.

It is also a candidate for use in the higher-rate 802.11a version of WiFi. (Perversely, the present 802.11b standard came before 802.11a.)

The second contender is a third-generation mobile phone standard derived from CDMA and dubbed CDMA2000 1xEV-DO. Verizon Wireless, a leading CDMA operator, is promoting 1xEV-DO throughout the United States as a high-speed, high-capacity wireless Internet technology that minimises network and spectrum requirements. Networks based on the system already serve millions of subscribers in the USA and the Far East. 1xEV-DO delivers a peak data rate of 2.4 Mbit/sec using just 1.25 MHz of spectrum, though individual users typically see two or three hundred kilobits per second.

regularly through the Verizon Airfone network to a file-server on the aircraft. Users can dip into a constantly updated cache of news, sport, weather, airline and other information, plus games.

In December 2002 United Airlines began making JetConnect available to Boeing 757 and 767 passengers for a fee of $5.99 per flight. A collaboration with Tenzing Communications last year added Web email capability. Since June 2003 United passengers have been able to use the new capability for a further $9.99 plus $0.10 for every kilobyte of data in excess of two kilobytes.

Continental Airlines, which rolled out JetConnect on some 300 Boeing 737s and 757s, McDonnell Douglas MD-80s and Embraer ERJ-145s from late 2002, began phasing in the Tenzing-supported email service in July 2003. A third JetConnect customer, US Airways, is offering the service on more than 80 Airfone-equipped Airbus A320-family aircraft.

Milestones in the development of the broadband system are approaching rapidly. Airfone hopes to win FAA approval for its WiFi technology and introduce it later this year. Having been granted an FCC experimental licence to test the broadband system, the company installed prototype equipment on a Beech King Air and began trials in May, aiming to complete them this summer.

Pallone describes early results as encouraging, with VoIP delivering voice quality at least equal to that of cellular on the ground. Ranges out to 200 miles from base stations have been achieved, he says, and hand-offs are working well.

Milestones met, fine-tuning under way

"WE'VE met all the early milestones and we're now fine-tuning," he reports. "Airlines, both existing and potential customers, are due to fly the system in the third quarter. Whenever we have told them about our way of doing broadband, they have said, 'it sounds great, but show me'. That's precisely what we are now doing."

Pallone says that acquisition, installation and support costs will be significantly less than those of satellite systems. He suggests that airline customers would recover their investment within three to four years, arguing that affordability – target for typical session cost is $10-15 – will lead to widespread, frequent use. The user will be able to pay by swiping a credit card, settling an integrated bill with his customary Internet or cellphone service provider, or by subscription.

"Airlines will use the service in different ways too," maintains Pallone. "For instance, once the broadband pipe is there, some will find it useful for transmitting aircraft maintenance information, flight manifests, weather information and other administrative data."

Airfone has set itself the ambitious target of launching the service by the end of next year. The other US terrestrial providers – AirCell and SkyWay Aircraft, with the latter making high claims for a planned new service based on infrastructure formerly owned by AT&T Wireless – will no doubt be watching with interest as they too develop their broadband solutions.

"We feel our business model could be adapted for other parts of the world," says Pallone. "Once ground stations are in place, there's a strong business case. To us it's the obvious way to provide passengers with levels of connectivity they experience on the ground." ✕